INVESTIGATIONS ON WEAR, MACHINABILITY AND TOOL CONDITION MONITORING OF HYBRID ALUMINIUM COMPOSITES

A THESIS

Submitted by

RADHIKA N.

in partial fulfilment for the award of the degree

of

DOCTOR OF PHILOSOPHY

FACULTY OF MECHANICAL ENGINEERING
ANNA UNIVERSITY OF TECHNOLOGY
COIMBATORE – 641 047

SEPTEMBER 2011

ABSTRACT

In the last two decades, research has shifted from monolithic materials to composite materials to meet the global demand for light weight, high performance and environmental friendly materials with enhanced properties like strength, wear and corrosion résistance. These composites consist of a ductile metallic matrix reinforced with a dispersion of hard ceramic phase in the form of particulates or fibers to impart additional strength as well as other properties to the material. Commonly used reinforcements include alumina and silicon carbide. These reinforcements have been used by various researchers for improving mechanical as well as tribological properties.

A detailed literature review was carried out to decide the choice of matrix and reinforcements for the present study. Accordingly, it was decided to fabricate composites with Al-Si10Mg (a heat treatable alloy) with alumina and graphite as reinforcements. Stir casting technique was employed for fabricating three different hybrid composites containing 3 wt%, 6 wt% and 9 wt% alumina respectively along with 3 wt% graphite particles.

Presence of hard alumina particles and soft graphite particles in the aluminium matrix significantly influence the mechanical, tribological and machining characteristics. Microstructural investigations as well as evaluation